Patent Claims

1. A device for cleaning the edges of substrates, in particular photomasks and/or semiconductor wafers, said device comprising:

at least one cleaning head that is provided with at least one media-delivering nozzle and at least one media-suctioning port; and

a movement mechanism to produce a relative movement between the cleaning head and a substrate; the cleaning head having a main body in which the media-suctioning port and an adjacent media-suctioning duct are embodied, and at least one first flange that is provided with a flat face which points towards the media-suctioning port and extends substantially perpendicular to a side surface of the main body, which side surface contains the media-suctioning port,

wherein the at least one media-delivering nozzle is disposed at a distance from the main body on the first flange, has at least one outlet port open to the flat face of the flange which points towards the media-suctioning port, and is directed substantially perpendicular to the flat face of the flange which points towards the media-suctioning port, wherein the outlet port of the media-

delivering nozzle is recessed in relation to the flat face of the flange or being level therewith, and

wherein the movement mechanism is controllable so as to maintain a distance of 0.05 to 0.5 mm, especially up to 0.3 mm, and preferably of 0.2 mm, between a surface of the substrate and the flat face of the flange which points towards the substrate surface during the cleaning process.

2. A device for cleaning the edges of substrates, in particular photomasks and/or semiconductor wafers, comprising at least one cleaning head that is provided with at least one media-delivering nozzle and at least one media-suctioning port, said cleaning head comprising:

a main body in which the media-suctioning port and an adjacent media-suctioning duct are embodied;

a first and second flange which are each provided with a flat face which points towards the media-suctioning port and extends substantially perpendicular to a side surface of the main body, said side surface containing the media-suctioning port, said flat faces of the flanges being parallel to one another; and

at least one media-delivering nozzle, which is disposed at a distance from the main body on the first flange, has at least one outlet port open to the flat face of the first flange which points towards the media-suctioning port, and is directed substantially

perpendicular to the flat face of the first flange which points towards the media-suctioning port, the outlet port of the media-delivering nozzle being recessed in relation to the flat face of the first flange or being level therewith, and the distance between the parallel flat faces of the flanges being greater by 0.1 mm to 1 mm, especially up to 0.6 mm, and preferably by 0.4 mm than the thickness of the substrate to be cleaned.

3. The device according to claim 1, characterized in that at least a second flange is provided which has a face extending substantially parallel to the flat face of the first flange which points towards the media-suctioning port, a distance between the parallel faces of the flanges being greater than the thickness of the substrate to be cleaned.

4. The device according to claim 3, characterized in that the distance between the parallel faces of the flanges is greater by 0.1 mm to 1 mm, especially up to 0.6 mm, and preferably by 0.4 mm than the thickness of the substrate to be cleaned.

5. The device according to any of claims 2 to 4, characterized by at least one further media-delivering nozzle which is disposed at a distance from the main element on the second flange and is open to the flat face of the flange which points towards the

media-suctioning port and is directed substantially perpendicular to the same, the outlet port of the media-delivering nozzle being recessed in relation to the flat face of the second flange or being level therewith.

6. The device according to any of claims 2 to 5, characterized in that the structure of the cleaning head is symmetrical to a plane extending centrally between the flanges.

7. The device according to any of the preceding claims, characterized in that the at least one media-delivering nozzle is pivotable on its respective flange.

8. The device according to any of the preceding claims, characterized in that the at least one media-delivering nozzle is pivotable on its respective flange by between 0° and 40°, preferably between 0° and 20°, in relation to a vertical of the flat face of the flange which points towards the media-suctioning port.

9. The device according to any of the preceding claims, characterized in that the at least one media-delivering nozzle has a plurality of outlet ports.

10. The device according to any of claims 1 to 9, characterized in that the at least one media-delivering nozzle has a slit-shaped outlet port.

11. The device according to either of claims 9 or 10, characterized in that the plurality of outlet ports or the slit-shaped outlet port extend along a line parallel to the face of the main body of the cleaning head, said face containing the media-suctioning port.

12. The device according to any of the preceding claims, characterized in that the distance between the at least one outlet port of the media-delivering nozzle and the face of the main body of the cleaning head having the media-suctioning port is between 2.5 mm and 6 mm, especially at 3 mm.

13. The device according to any of the preceding claims, characterized by at least one media supply, which is connected to a media-delivering nozzle, and a control device for regulating the media supply such that during cleaning the medium is substantially in an unpressurized condition at at least one outlet port of the at least one media-delivering nozzle.

14. The device according to any of claims 1 to 12, characterized by at least one media supply which is connected to at least one media-delivering nozzle, and a device for regulating the media supply such that during cleaning the medium is conveyed through the media-delivering nozzle and directed onto the substrate to be cleaned under pressure.

15. The device according to claim 14, characterized in that the pressure is between 10 KPa and 30 KPa, and is preferably 20 KPa.

16. The device according to any of claims 4 to 15, characterized by a control device for separately controlling the media-delivering nozzles.

17. The device according to any of the preceding claims, characterized in that the flange has a recess in which the media-delivering nozzle is at least partially disposed.

18. The device according to any of the preceding claims, characterized in that the media-suctioning port is circular in form.

19. The device according to any of the preceding claims, characterized in that the media-suctioning port has a diameter which is greater by approximately 0.2 mm than the thickness of the substrate to be cleaned.

20. The device according to any of the preceding claims, characterized in that the media-suctioning duct tapers away from the media-suctioning port.

21. The device according to any of the preceding claims, characterized by a suctioning device which is connected to the media-suctioning duct, and a control device for controlling the suctioning device.

22. The device according to any of the preceding claims, characterized by a substrate support and a device for producing a relative movement between the substrate support and the cleaning head.

23. The device according to any of the preceding claims, characterized by a control device for setting an overlap degree of the at least one flange with a main face of the substrate.

24. The device according to any of the preceding claims, characterized by a control device for controlling a relative movement between the cleaning head and the substrate such that the cleaning head runs along at least a part area of at least one edge of the substrate, maintaining a constant distance.

25. A method for cleaning the edges of substrates, in particular photomasks and/or semiconductor wafers, comprising the following method steps:

- disposing a cleaning head with at least one media-delivering nozzle and at least one media-suctioning port adjacent to a substrate such that the media-delivering nozzle is directed towards at least one peripheral area of a main face of the substrate to be cleaned, and the media-suctioning port lies in the area of the media-delivering nozzle adjacent to a side or edge face of the substrate, a distance between a flat face of a flange of the cleaning head carrying the media-delivering nozzle and the peripheral area of the substrate to be cleaned being set to 0.05 to 0.5 mm, especially up to 0.6 mm, and preferably to 0.2 mm;
- applying a cleaning fluid to the peripheral area of the substrate with the at least one media-delivering nozzle; and

- suctioning or drawing off of the complete cleaning fluid by means of the media-suctioning port and a media-suctioning duct adjacent thereto.

26. The method according to claim 25, characterized in that the cleaning head has at least two media-delivering nozzles which point towards one another, and the peripheral area of the substrate to be cleaned is received between the at least two media-delivering nozzles during the disposing step, a distance between a flat face of a flange of the cleaning head carrying the second media-delivering nozzle and the peripheral area of the substrate to be cleaned being set to 0.05 to 0.5 mm, especially up to 0.6 mm, and preferably to 0.2 mm.

27. The method according to claim 25 or 26, characterized in that the cleaning fluid is supplied to the at least one media-delivering nozzle such that it is substantially unpressurized at an outlet port of the same, and is substantially drawn out of the at least one media-delivering nozzle by the suctioning force by means of the media-suctioning port and the adjacent media-suctioning duct, and is applied to the peripheral area of the substrate to be cleaned.

28. The method according to claim 25 or 26, characterized in that the cleaning fluid is drawn with pressure through the media-delivering nozzle and applied to the peripheral area of the substrate to be cleaned.

29. The method according to claim 28, characterized in that the pressure is in a range of between 10 KPa and 30 KPA, preferably at 20 KPa.

30. The method according to any of claims 25 to 29, characterized in that the cleaning fluid is applied substantially perpendicular to the peripheral area of the substrate.

31. The method according to any of claims 25 to 30, characterized in that the cleaning fluid is applied to the peripheral area of the substrate pointing at an angle which deviates between 0° and 40°, preferably between 0° and 20° from a vertical to the substrate surface.

32. The method according to any of claims 26 to 31, characterized in that the media-delivering nozzles are controlled separately.

33. The method according to claim 32, characterized in that different pressures are applied to the media-delivering nozzles.

34. The method according to claim 32 or 33, characterized in that different fluids are applied to the media-delivering nozzles.

35. The method according to any of claims 25 to 34, characterized in that a relative movement between the cleaning head with the media-delivering port and the media-suctioning port and the substrate is produced so that the cleaning head moves along at least one part area of at least one edge of the substrate.

36. The method according to claim 35, characterized in that the distance between the media-suctioning port and the side face of the substrate is kept constant during the movement.

37. The method according to claim 35 or 36, characterized in that the relative movement between the substrate and the cleaning head is brought about by a movement of the substrate and/or the cleaning head.

38. The method according to any of claims 25 to 37, characterized in that the distance between the media-suctioning port and the side face of the substrate is set to between 0.5 mm and 2 mm, especially to 1 mm, during edge cleaning.

39. The method according to any of claims 25 to 38, characterized in that a peripheral area of the substrate of between 2 mm and 5 mm, especially 3 mm, is cleaned.

40. The method according to any of claims 25 to 39, characterized in that the width of a peripheral area to be cleaned is set by setting an overlap degree of the at least one media-delivering nozzle with a side face of the substrate.

41. The method according to any of claims 25 to 40, characterized in that the width of a peripheral area of the substrate to be cleaned is at least partially achieved by pivoting the media-delivering nozzle.

42. The method according to any of claims 25 to 41, characterized in that at the end of a cleaning process, first of all application of the cleaning fluid is stopped, and the suctioning of the cleaning fluid is ended after a predetermined period of time after the application of the cleaning fluid has finished.

43. The method according to any of claims 25 to 42, characterized in that the media supply and/or the suctioning of the cleaning fluid is controlled dependent upon the contour of the substrate.

44. The method according to any of claims 25 to 43, characterized in that when the media-delivering nozzle reaches a corner area of the substrate, the media supply is interrupted before it reaches the corner, whereas suctioning of the cleaning fluid continues.